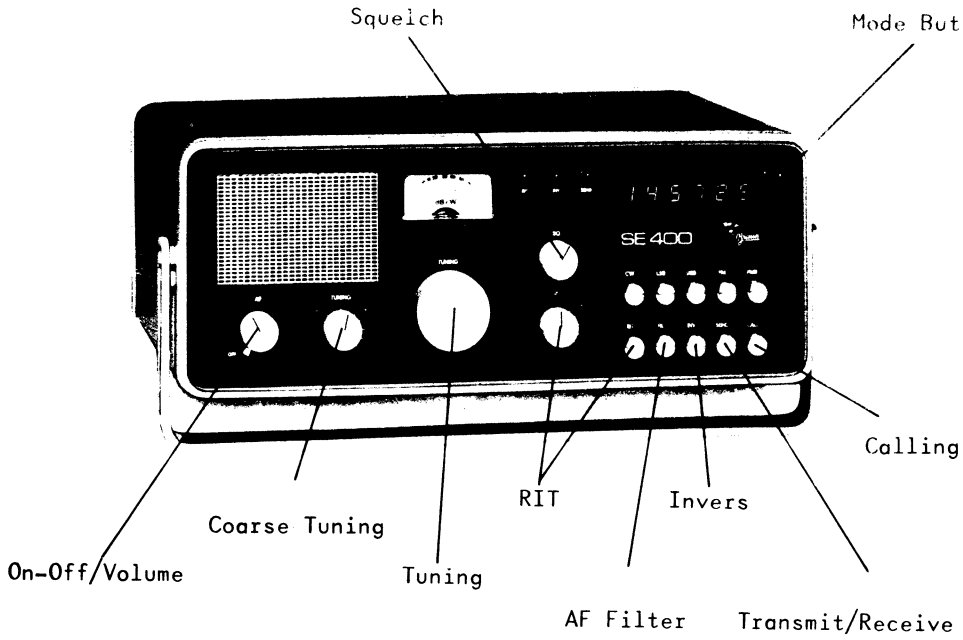
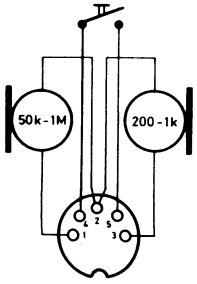
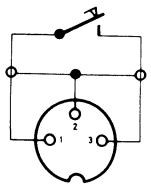
BRAUN SE 400 FM/SSB 144 MHz

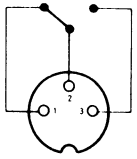




Microphone/PTT plug

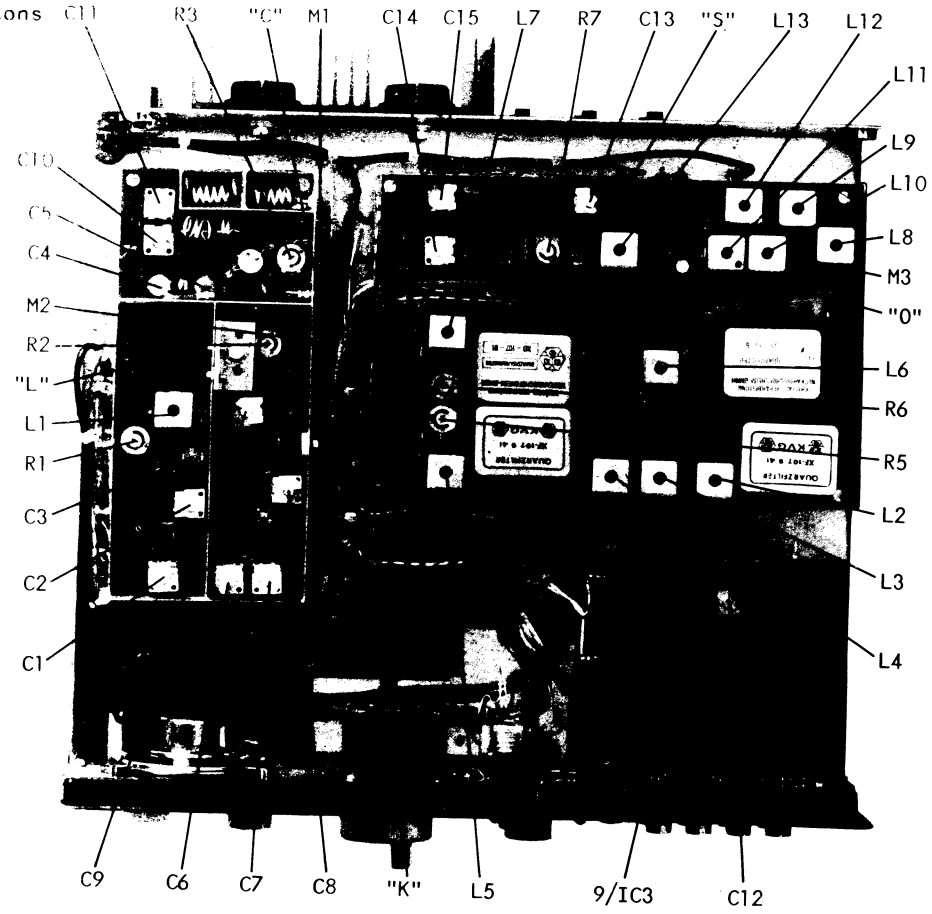


Key/Tape recorder plug

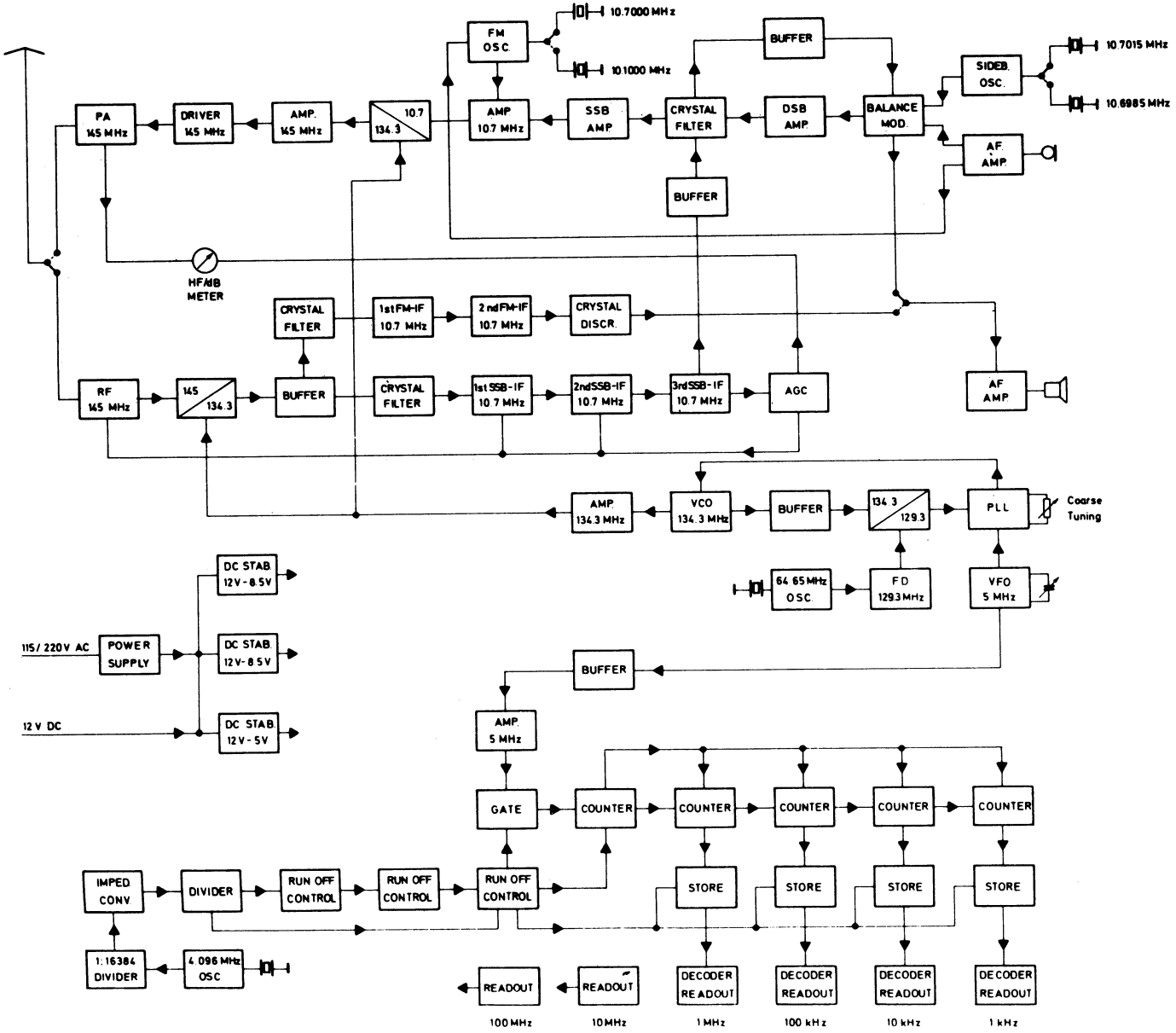


Remote control plug

BRAUN SE 401 FM/SSB 144 MHz



SCHEMA A BLOCCHI



3. SERVICE

3.1. TEST EQUIPMENT REQUIRED FOR SERVICE :

The following test equipment is required for testing and repair:

1. Multimeter (at least 10 kΩ/V)
2. 15 W load resistor, 50 Ω at 145 MHz, SWR not worse than 1 : 1,1
3. Frequency counter for 150 MHz, resolution 10 Hz.
4. Signal generator for 145 MHz, output voltage 100 µV / 50 Ω
5. Attenuator 0 - 80 dB / 50 Ω.
6. Frequency deviation meter for ± 5 kHz.

3.2 OPERATING VOLTAGES :

All voltages are measured at 220 V AC operation at the points given in the circuit diagram.

1. A (yellow wires): approx. 16 V on receive, and 14 V on transmit.
2. B (yellow/green wires): approx. 16 V on receive.
3. C (yellow/red wires): approx. 14 V on transmit.
4. D and Z (yellow/white wires): 8.5 V.
5. E (green/white wires): 8.5 V on receive.
6. F (red/grey wires): 8.5 V on transmit.
7. G (pink wires): approx. 5 V.
8. N (coaxial cable) inner conductor: approx. 2 V connect to counter.
9. P (blue wire): approx. 5 V on receive without signal. Voltage decreased with increasing signal strength. Use voltmeter with more then 100 kΩ/V for this measurement.
10. U (green/black wire): 8.5 V on FM and FMR receive modes.
11. V (red/blue wire): 8.5 V on FM transmit.
12. W (red/black wire): 8.5 V on FMR transmit.
13. X (black wire): 8.5 V in CW/USB mode.
14. Y (white wire): 8.5 V in LSB mode.
15. H (green/brown wire): 8.5 V by CW, LSB and USB reception.

The given colours can appear at other positions, but are not important for service and alignment.

3.3 QUIESCENT CURRENT OF PA :

The quiescent current of the PA transistor T 4 is aligned as follows:

1. Connect multimeter (range 1.5 - 3 V) with + to C and – to MP 1 **(Fig. 4)**
2. Connect 50 Ω / 15 W load resistor to antenna output.
3. Release all mode switches. Depress »SEND« button.
4. Align R 3 to obtain 0.7 V.

3.4 QUIESCENT CURRENT OF DRIVER :

The quiescent current of the driver transistor T 8 is aligned as follows:

1. Connect multimeter (range 1.5 - 3 V) with + to C and – to MP 2.
2. See 3.3.2 and 3.3.3
3. Align R 2 to obtain 1.3 V.

3.5 FREQUENCY DEVIATION LIMITING :

If the frequency deviation limiting (5 kHz) is to be adjusted of aligned to a different standard deviation, this can be done as follows:

1. Connect 50 Ω / 15 W load resistor to antenna socket. Connect microphone.
2. Couple the frequency deviation meter and align for 145.000 MHz. Range: more than ± 5 kHz.
3. Depress the FM-mode button. Tune to 145.000 MHz (same frequency as deviation meter). Depress »SEND« button.
4. Set »MIKE« control to fully clockwise position.
5. Modulate a long, loud »aaah« directly into the microphone. Align R 11 (HUB/DEV.) to the required deviation limiting (± 5 kHz in Europe).

3.6 MICROPHONE GAIN :

After successful alignment of the deviation limiting (3.5) it is necessary to align the microphone gain as follows:

1. Align as 3.5.1 to 3.5.3
2. Speak normally into microphone, and align R 19 (MIKE) so that the deviation meter swings between ± 2 and ± 3 kHz.
3. Depress the »CW« button. Connect pins 1 and 3 of the »TASTE/KEY« connector.
4. Read off the power indicated on the dB/W meter.
5. Depress »USB« button. Whistle loudly into the microphone at the required distance. Align R 13 (SSB-level, see **Fig. 5**) in an anticlockwise direction until half the CW-power shown in 3.6.4 is indicated.

3.7 CALLING-TONE DEVIATION :

After successful alignment of the deviation limiting (3.5) the calling-tone deviation is adjusted as follows:

1. Align as given in 3.5.1 and 3.5.3
2. Depress »CALL« button. Align R 20 (CALL-DEV) to the required calling-tone deviation (normally ± 3 kHz).

3.8 CALLING-TONE FREQUENCY :

The calling-tone frequency is aligned to the nominal frequency (1750 Hz in Europe) with the aid of L 20 **(Fig. 5)**. Frequency counter to pin »j« **(Fig. 5)**.

3.9 dB - METER :

If the dB-meter does not return to zero without signal with a 50 Ω termination at the antenna socket, or if weak signals are not indicated, it is possible to aligned to zero with R 17 **(Fig. 5)**.

Full-scale deflection of the dB-meter (70 dB = 100 µV) can be aligned with R 18 **(Fig. 5)**. The control characteristics and thus the dB-meter characteristics can be altered with R 16 **(Fig. 5)**.

All dB-meter alignment should **only** be made in warmed-up condition.

3.10 WATTMETER :

The wattmeter can be aligned with R 12 **(Fig. 5)**. This alignment should only be made when a calibrated power meter with precision 50Ω load resistor are available. Never use an antenna as load resistor for wattmeter alignment.

3.11 SQUELCH :

If the squelch threshold is not as required it can be aligned with R 21 **(Fig. 5)**.

3.12 VFO COARSE TUNING :

If the VFO coarse tuning is not able to completely cover the whole of the 2 m band, this can be corrected as follows:

1. Depress coarse-tuning knob and place in fully clockwise position.
2. Whilst depressing the knob, align C 16 **(Fig. 5)** until approx. 146.100 is indicated on built-in counter.

The indicated frequency will increase by 50 to 200 kHz on closing the VFO-cover. This is of no importance to the operation of the coarse tuning.

3.13 FREQUENCY CHECK :

Frequency corrections can only be made in conjunction with a suitable external frequency counter (see 3.1.3). The built-in counter is also required. FM-repeaters cannot be used for checking the frequency since their frequencies are often inaccurate and instable.

If a frequency error is established, the following frequencies should be checked separately:

1. VFO (see 3.14)
2. FM crystals (see 3.15)
3. SSB crystals (see 3.16)
4. Built-in counter (see 3.17)

3.14 VFO FREQUENCY :

The VFO frequency is aligned as follows:

1. Connect external counter to feedthrough capacitor »0« **(Fig. 5)**
2. Set VFO so that the built-in counter jumps between 144.999 and 145.000.
3. Align L 19 **(Fig. 5)** to indicate 134.299.51 on the external counter.

3.15 FM/FMR FREQUENCIES :

The FM frequencies are aligned as follows:

1. Connect a 50 Ω / 15 W load resistor to antenna output.
2. Connect external counter to glass feedthrough **(Fig. 4)**.
3. Depress »FM« and »SEND« buttons and align to 10.700 MHz ± 200 Hz.
4. Depress »FMR« and »SEND« buttons and align R 5 **(Fig. 4)** to 10.100 MHz ± 200 Hz.

3.16 SSB FREQUENCIES :

The SSB frequencies are aligned as follows:

1. Connect the stator of trimmer C 13 **(Fig. 4)** to the external counter.
2. Depress the »USB« button and align C 15 **(Fig. 4)** to 10.69850 MHz.
3. Depress the »LSB« button and align C 14 **(Fig. 4)** to 10.70150 MHz.

3.17 FREQUENCY READOUT :

An alignment of the timebase frequency is only necessary after replacement of the crystal or IC 3 (oscillator and divider IC). The counter will indicate 148.888 when the timebase is inoperative.

1. *Connect the external counter to pin 9 of IC 3* **(Fig. 4)**.
2. Align C 12 **(Fig. 4)** to 4.09600 MHz.

3.18 SSB CARRIER SUPPRESSION :

A fully screened receiver is required for alignment of the carrier suppression (see 4.9 for exact alignment details).

1. Connect a 50 Ω / 15 W load to the output socket.
2. Connect the indicator unit.
3. Depress »CW« and »SEND« buttons. Align R 7 and C 13 alternately for minimum carrier **(Fig. 4)**.

3.19 FUSES :

A power line fuse of 0.7 A (5 x 20 mm) is provided as well as a 3 A fuse for battery operation (5 x 20 mm) which protect the unit. Both fuses are be found on the power supply board (see **Fig. 5)**.

4. ALIGNMENT

4.1. PLEASE NOTE :

An alignment should only be carried out by qualified persons with the aid of the measuring equipment described in 4.2.

Before commencing alignment it should be established if really an alignment is necessary. Usually, an alignment is only necessary when a component such as an inductance or trimmer was defective and had to be replaced.

4.2 MEASURING EQUIPMENT required for the alignment :

The following equipment is required in addition to those given in 3.1.:

1. RF-Millivoltmeter (Z min. 5 kΩ).
2. VHF Sweep generator with markers.
3. Spectrum analyzer upto 200 MHz, dynamic range min. 70 dB.
4. RF-Wattmeter 15 to 25 W.
5. RF-attenuator or directional coupler (approx. 40 dB) 15 to 25 W.

4.3 RECEIVER INPUT CIRCUIT :

1. Short point »S« to ground (blue/white wire), see **Fig.4**.
2. Short point »0« to ground (coaxial cable), see **Fig. 4**.
3. Set sweep generator to a center frequency of 145.0 MHz and connect to antenna connector.
4. Connect the sweep oscilloscope to connection M 3 **(Fig. 4)**.
5. Depress »CW« button and align L 10, L 11, L 12 for a symmetrical passband curve (- 3 dB slope approx. 1.3 MHz from the center frequency). After completing the receiver alignment, L 12 should be corrected together with a 50 Ω noise generator to obtain the best signal-to-noise ratio.

4.4 SSB IF :

1. Connect the signal generator (145 MHz/approx. 0.5 µV) to antenna connector.
2. Depress »CW« button and align L 8, L 2, L 3, L 4 for maximum reading on the dB-meter. L 13 should be aligned according to 4.9. If a tendency to oscillation exists, possibly in a cold state, this can be neutralized by reducing the IF gain by detuning L 3.
3. Align the dB meter according to 3.9.

4.5 FM IF :

1. Align according to 4.4.2
2. Depress »FM« button and align L 6 without input signal for max. rectified voltage (approx. - 0.5 V to - 1 V) at M 4 (gate of T 46, **Fig. 5**). The Z of the meter must be greater than 5 MΩ.

4.6 TRANSMIT EXCITER :

1. Connect a spectrum analyzer (± 20 MHz) via a suitable 50 Ω / 15 W attenuator and terminating resistor to the antenna socket.
2. Tune to 145.000 MHz.
3. Depress »CW« and »SEND« buttons.
4. Align the residual carrier line for maximum in the given order: L 1, C 4, C 5, C 6, C 7, C 8.

4.7 TRANSMITTER OUTPUT STAGES :

1. Connect a Wattmeter with 50 Ω termination resistor to the output socket.
2. Tune to 145.000 MHz.
3. Depress »FM« and »SEND« buttons.
4. Align the following in the given order for maximum output: C 11, C 10, C 5, C 4, C 9 (**Fig. 4**). This alignment should be carried out several times.
5. Repeat alignment 4.6 and 4.7.
6. Check the local oscillator voltage if the output power is too low (see 4.10.3).
7. Note FM output power (see 4.8.7).

4.8 SPECTRUM ALIGNMENT :

1. See 4.6.1 to 4.6.3
2. Adjust the spectrum analyzer so that the peak of the main carrier is on the ± 0 dB line.
3. Align R 1, C 3 and L 7 (**Fig. 4**) for a clean signal (spurious signals better than - 60 dB).
4. Using the fast tuning, check to see whether the spurious rejection is greater than 60 dB over the whole band (realign if necessary).
5. Depress »FMR« button and check whether the signal is clean in the upper half of the band (realign L 5 if necessary).
6. Align the FM crystal oscillators according to 3.15 with a high impedance frequency counter connected to »K«.
7. Connect a Wattmeter with 15 W termination resistor to antenna socket. Connect contacts 1 and 3 of the »KEY« connector, depress the »CW« button, and align R 14 so that the CW output is the same as the FM output (see 4.7.7).

4.9 SSB CARRIER SUPPRESSION :

1. Align the SSB crystal oscillators as given in 3.16.
2. See 4.6.1 to 4.6.3
3. Interconnect contacts 1 and 3 of the »KEY« connector.
4. Reduce the output power to approx. 5 W with the aid of R 14 (**Fig. 5**).
5. Align L 13 for maximum output power.
6. Adjust R 14 until the RF output stops increasing.
7. Remove connection as given in 3.
8. Align the residual carrier line to minimum with C 13 and R 7.
9. Depress the »LSB« button and check the carrier suppression (if required realign C 14 until better than - 45 dB).

4.10 LOCAL OSCILLATOR VOLTAGE :

1. See 4.7.1 to 4.7.3
2. Connect RF millivoltmeter (see 4.2.1): Inner conductor to »L« (**Fig. 4**), outer conductor to ground.
3. Align L 17 and L 18 (**Fig. 5**) for maximum:
   At least 150 to 300 mV rms.

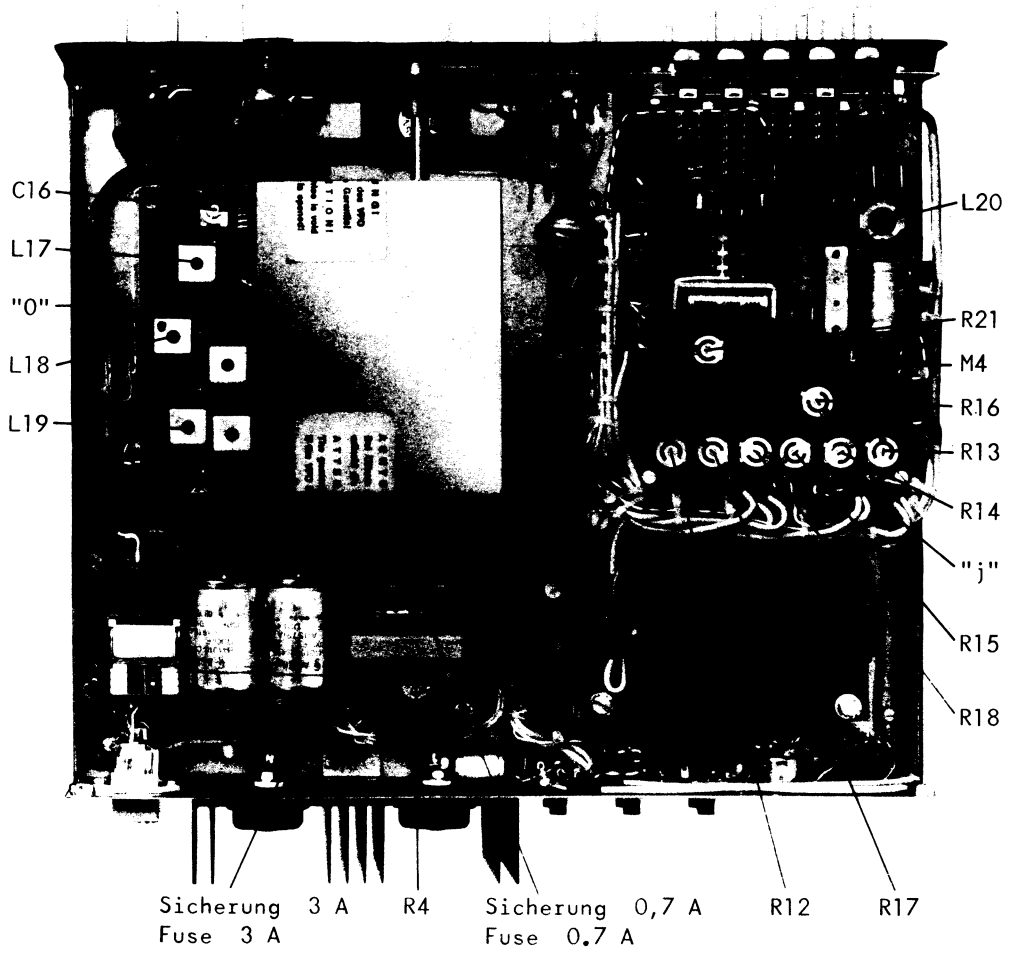
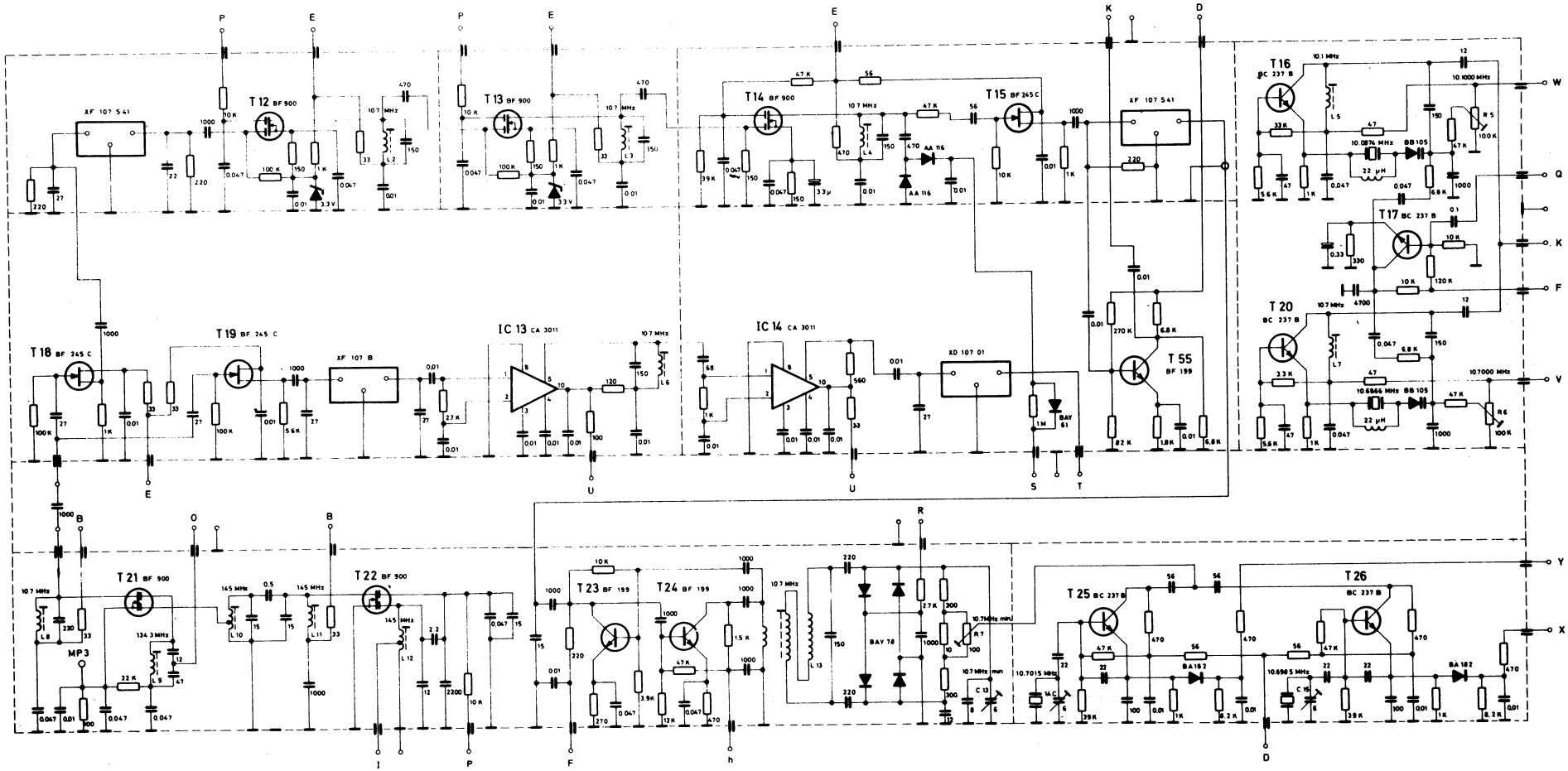


Figure 5

RICEVITORE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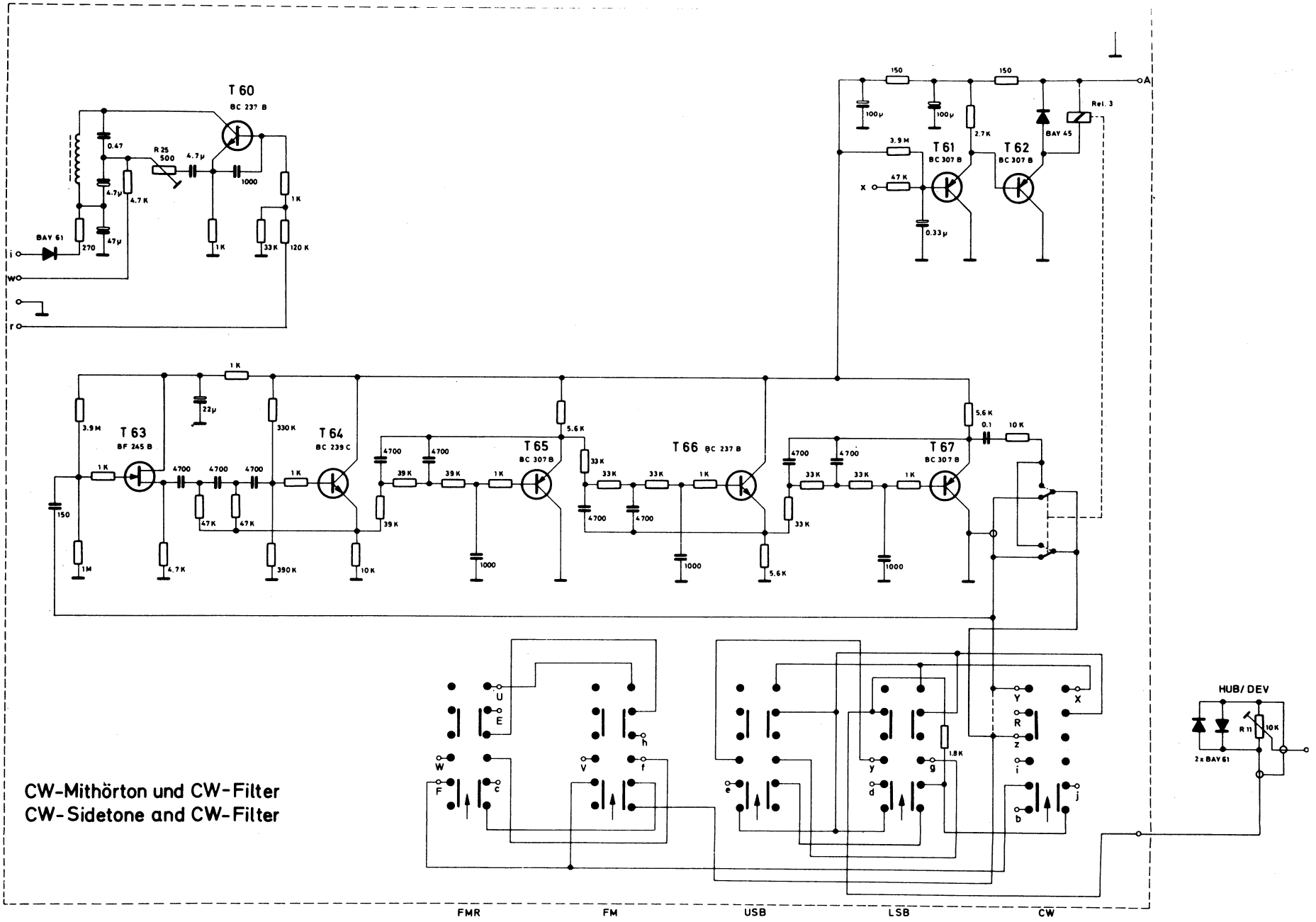
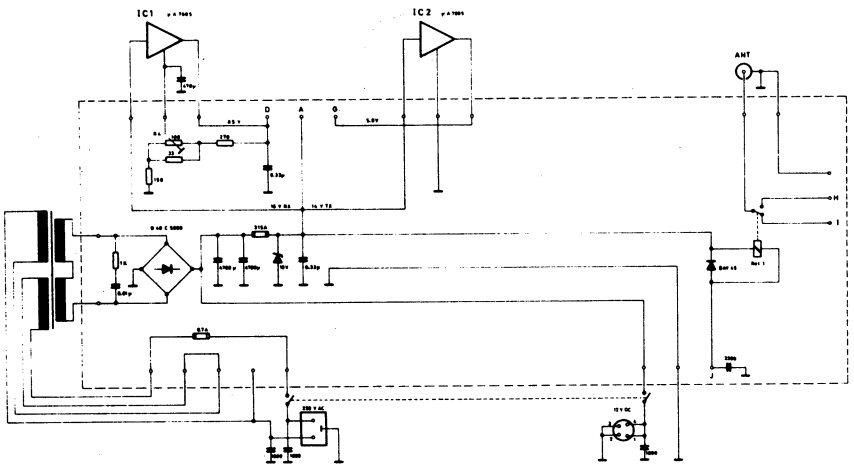
T 13 BF 900
T 14 BF 900
T 15 BF 245 C
T 16 BC 237 B
T 17 BC 237 B
T 18 BF 245 C
T 19 BF 245 C
T 20 BC 237 B
T 21 BF 900
T 22 BF 900
T 23 BF 199
T 24 BF 199
T 25 BC 237 B
T 26 BC 237 B
T 55 BF 199
IC 13 CA 3011
IC 14 CA 3011
XF 107 S 41
XF 107 B
XD 107 01
BB 105
BA 182
BAY 78
BAY 61
AA 116
MP3

SIDETONE E FILTRO CW



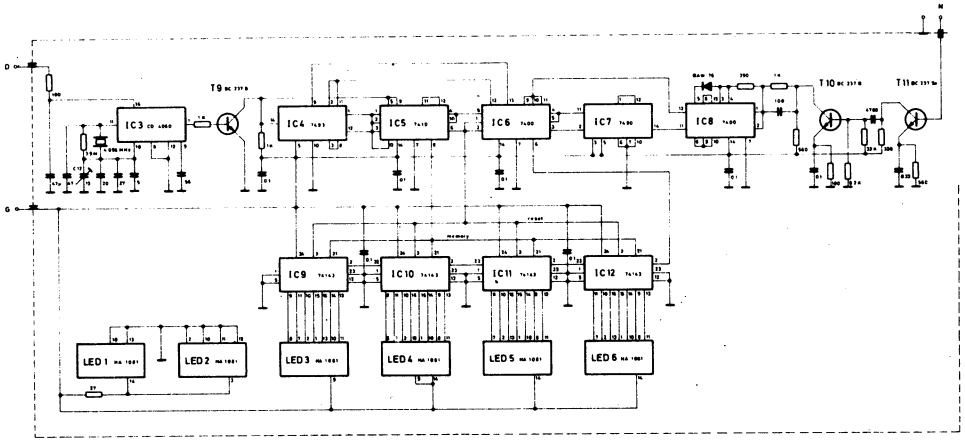
CW-Mithörton und CW-Filter
CW-Sidetone and CW-Filter

ALIMENTATORE



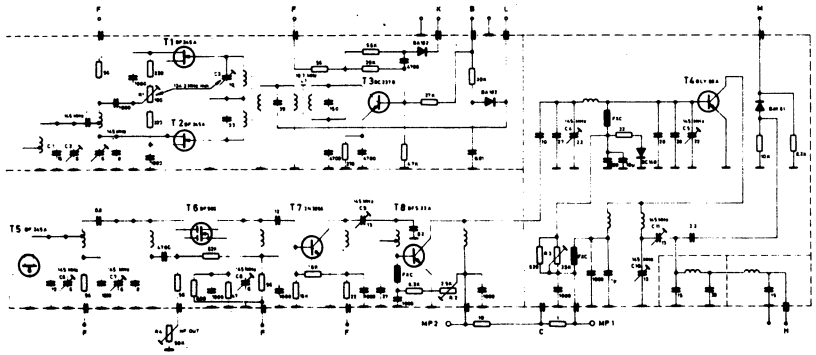
/ Power Supply
SE 400

CONTATORE



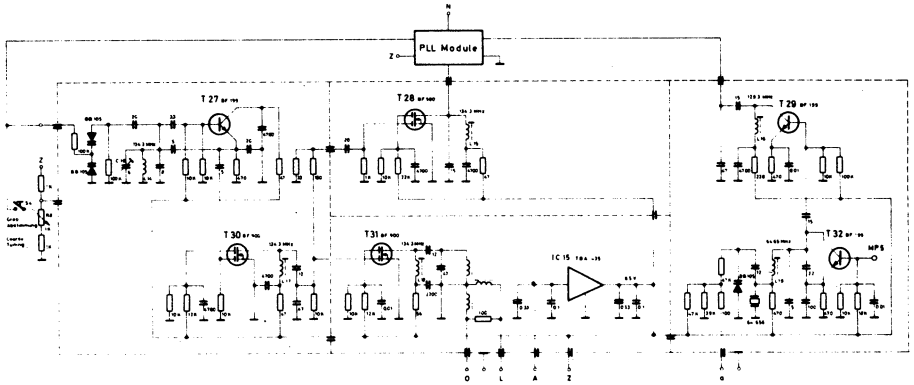
Counter
SE 400

TRASMETTITORE

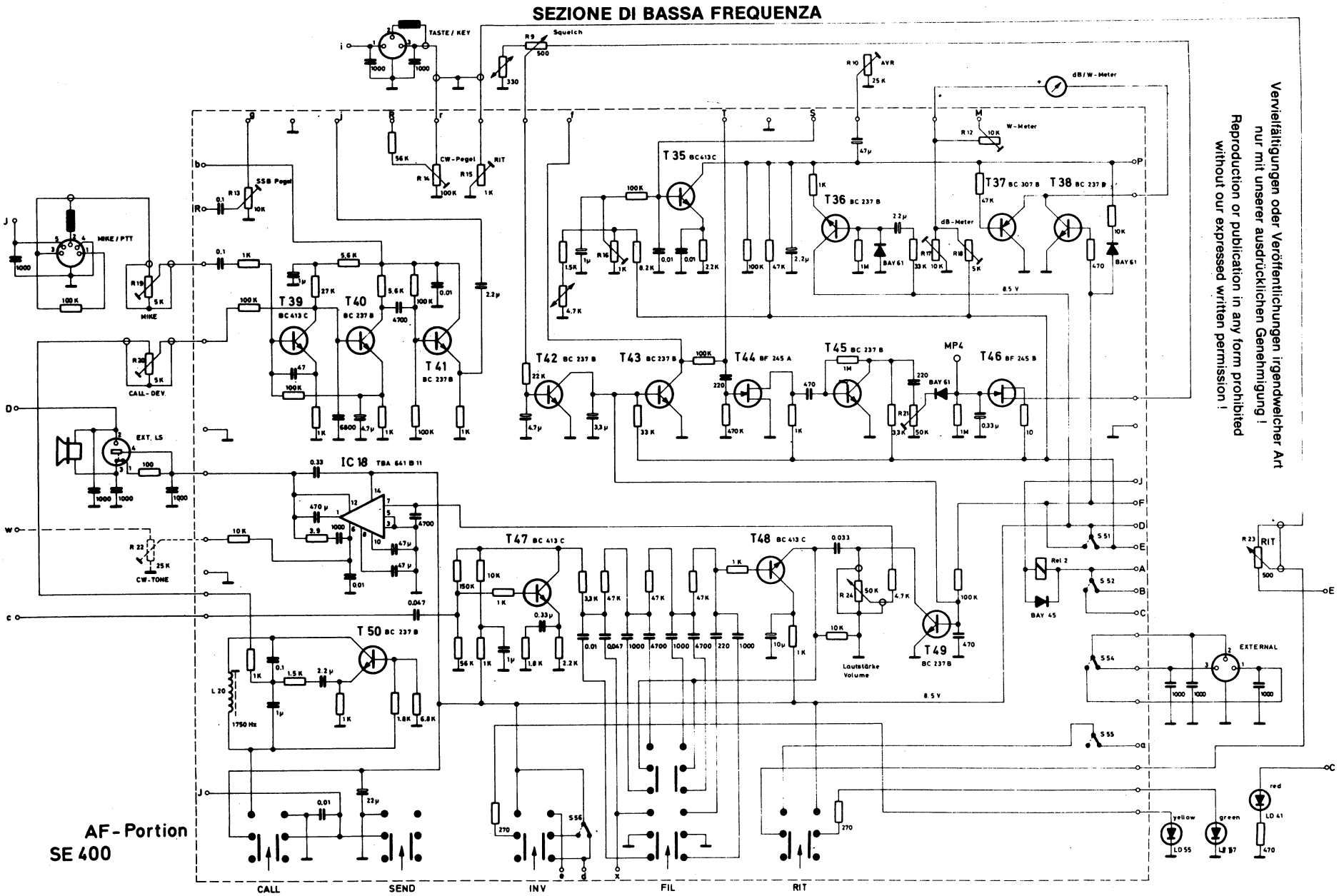


Transmitter
SE 400

VCO



VCO
SE 400



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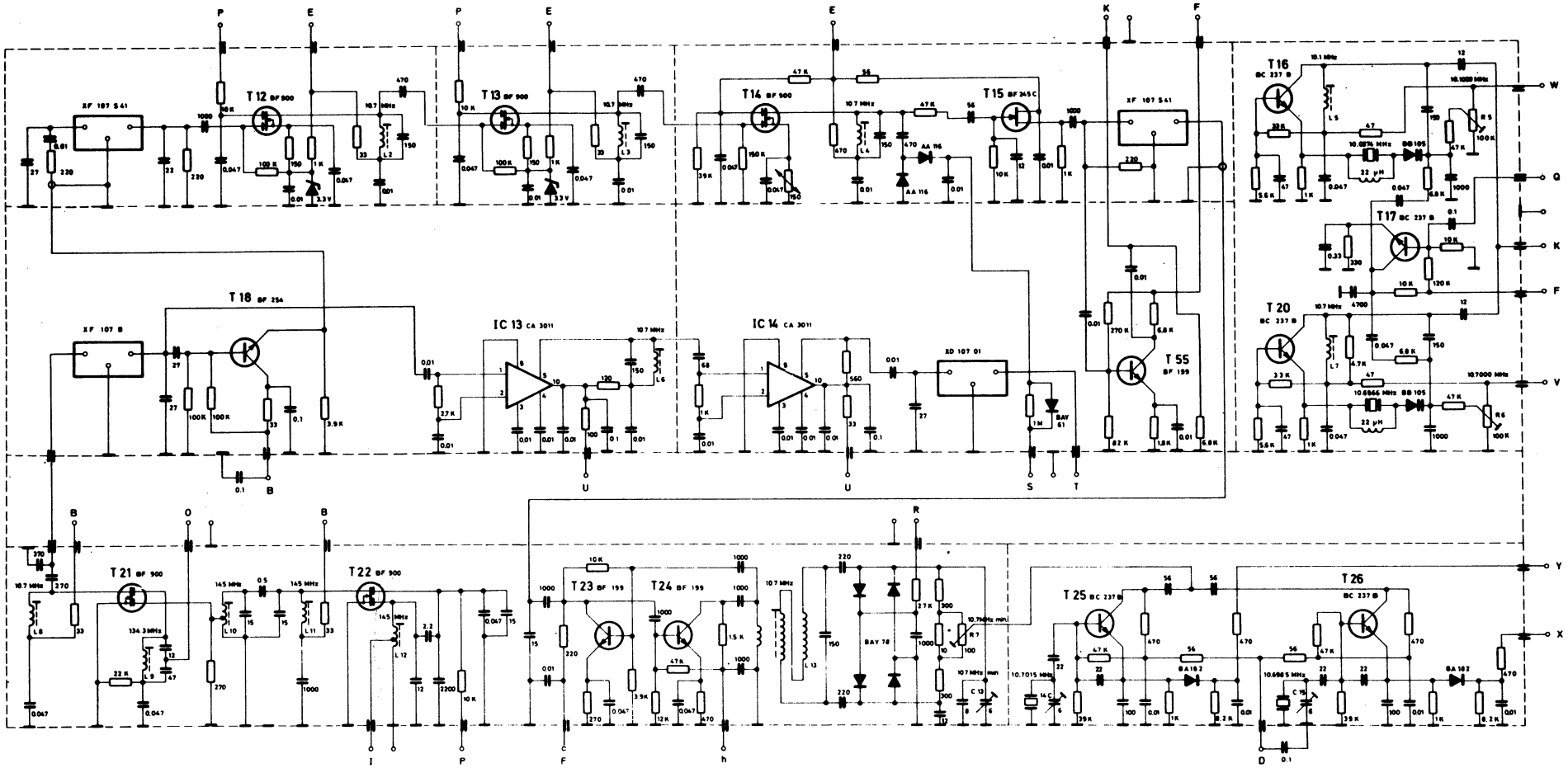
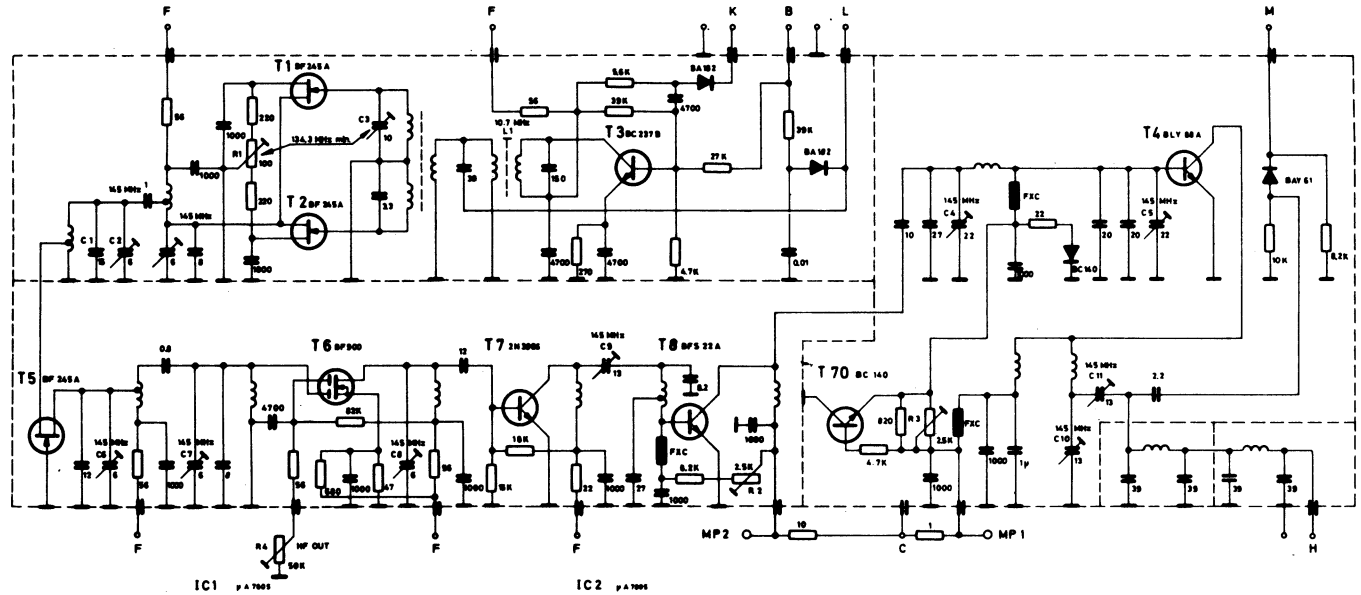
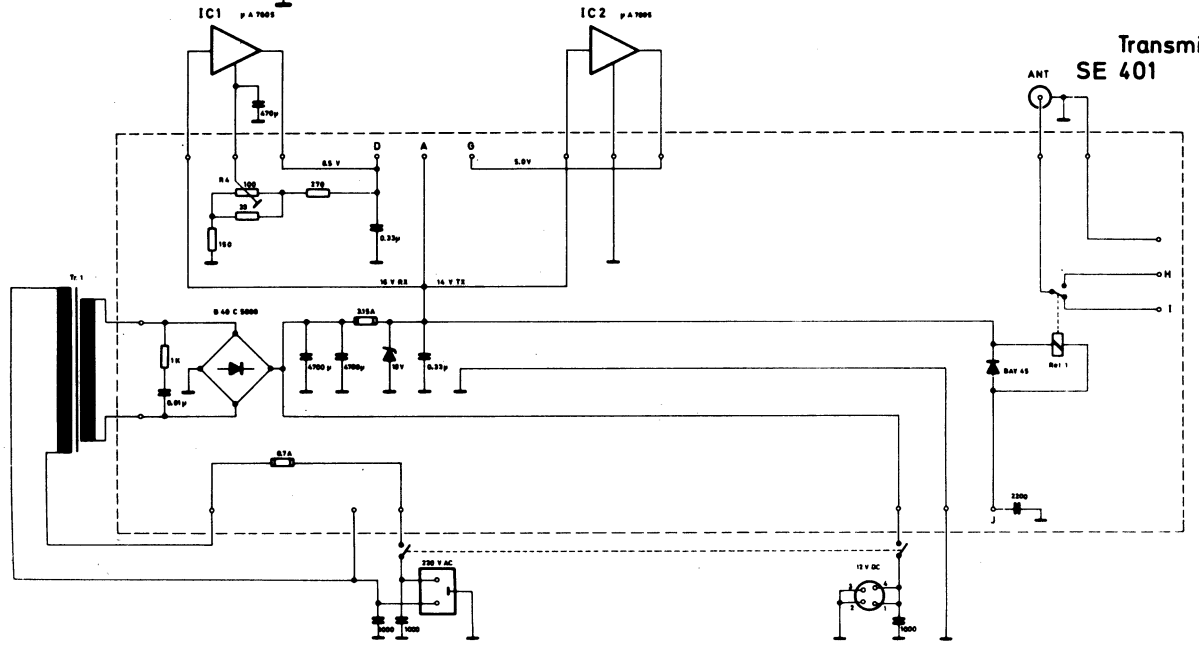


Receiver
SE 401





Transmitter
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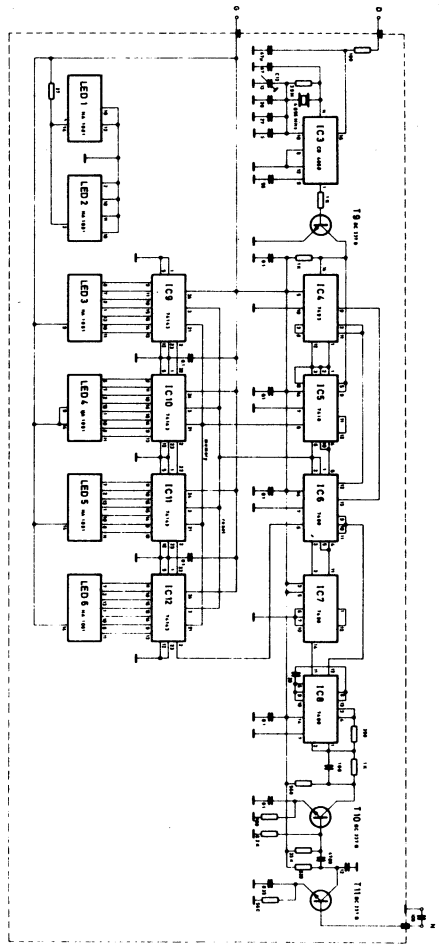
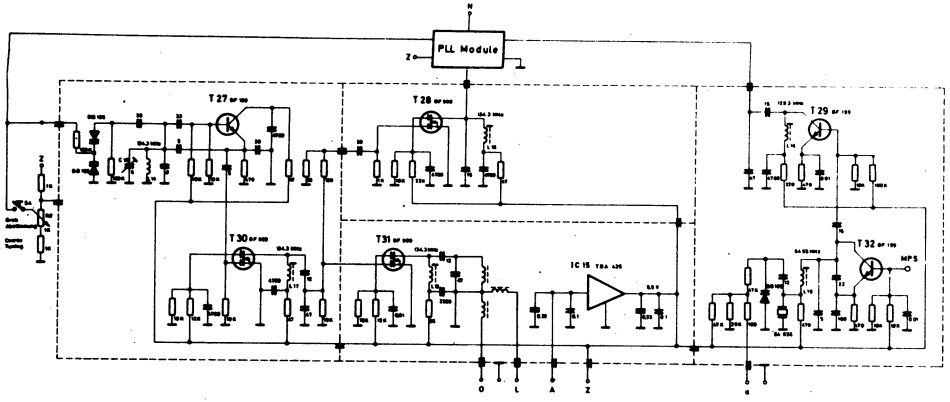
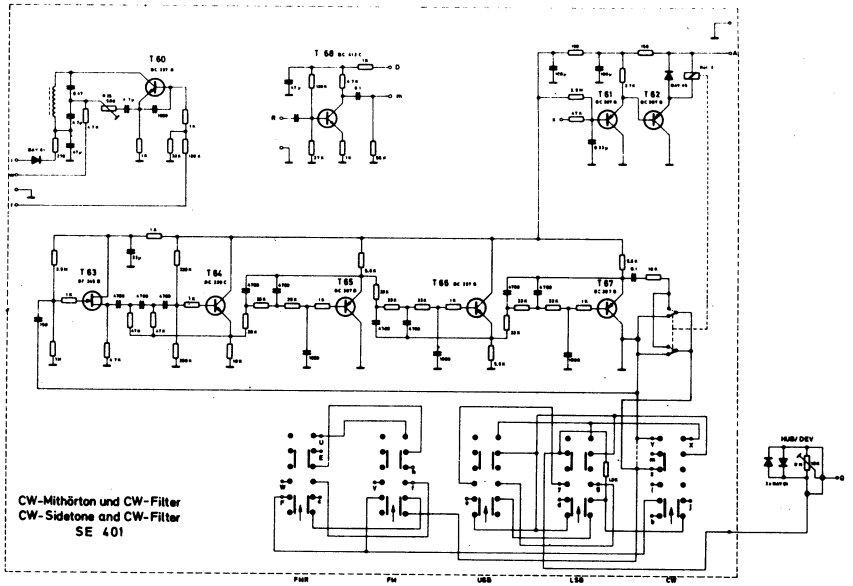


Counter
SE 401

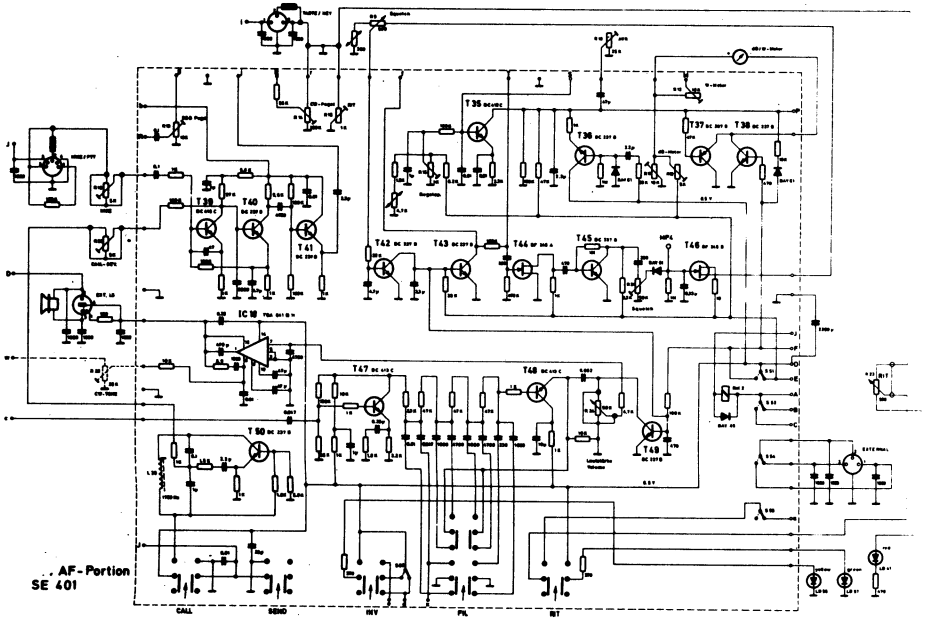
Power Supply
SE 401



SGO/ VCO
SE 401



CW-Mithörton und CW-Filter
CW-Sidetone and CW-Filter
SE 401



AF-Portion
SE 401